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A case-control study of epithelial ovarian cancer

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With data from a study of 296 patients with primary epithelial ovarian cancer and 343 patients hospitalized because of other conditions, we estimated ovarian cancer risk in accordance with reproductive and other factors. Risk was greatest among women of lower parity, especially among women who said they planned to have children but could not. The protective effect of oral contraceptives seen in other studies was observed only in subgroups of our study population. Women who had breastfed their children had decreased risk, but the number of months of breastfeeding was not related to risk. Incomplete pregnancies did not provide the protection seen for live births. A family history of ovarian cancer and a medical history of breast cancer were both strong risk factors. None of the nonreproductive factors that we examined, including childhood illnesses, tobacco and alcohol consumption, obesity, and selected adult diseases, was convincingly associated with risk. (Am J Obstet Gynecol 1989;161:10-6.)

Key words: Ovarian cancer, endogenous estrogens, infertility, oral contraceptives, epidemiology

The causes of ovarian cancer are mainly unknown.[1, 2, 3] Known risk factors are age (incidence rises until about age 60 years), race (white women are at higher risk than nonwhite women), low parity, infertility, a history of endometrial or breast cancer, a family history of ovarian cancer, and exposure to radiation. Probable protective factors are oral contraceptives and surgical menopause. Although the importance of reproductive and contraceptive history has been firmly established, questions remain. How do parity, pregnancy, and fetal loss jointly affect risk? Does the timing of the first birth affect risk? Is infertility an independent risk factor, separate from the effects of low parity? In addition, many nonreproductive factors have been suggested. With interview and medical records data from a case-control study, we have estimated ovarian cancer risk according to various reproductive and other suggested risk factors to add to our knowledge with regard to these persistent issues.

Methods

Study methods are described in detail elsewhere.[4] All eligible cases involved women aged 20 to 79 years who resided in the Washington, D.C., metropolitan area and who were first diagnosed by operation with microscopically confirmed primary epithelial ovarian cancer during the period August 1978 to June 1981. Cases included tumors of low malignant potential as well as frankly malignant tumors because risk factors for the two groups were similar.[5] For all participants with ovarian cancer, we obtained the diagnostic microscopic slides and pertinent medical records. After review we excluded 30 women found not to have definite primary ovarian cancer of the epithelial type by microscopic (H.J.N.) or clinical (L.M.) evaluation. Several of these cases had been classified as mucinous ovarian cancer but actually were of colorectal origin.

We identified 400 cases and interviewed 296 women (74%). Losses were a result of death (n = 44), disability (n = 12), physician's refusal (n = 8), patient's refusal (n = 33), or other reasons (n = 7). As shown in Table I, serous and endometrioid types predominated.

Control participants were identified from hospital discharge lists and were matched with women with epithelial ovarian cancer according to hospital, age, and race (Table II). A woman was not eligible to be a control if her discharge diagnosis was psychiatric or was potentially related to the major exposures of interest. For all potential control participants, we confirmed in the physician and hospital records that the women had at least one ovary intact and excluded those who did not because they were not at risk of ovarian cancer. We identified 439 controls of whom we interviewed 343 (78%). Losses were a result of death (n = 13), disability (n = 8), physician's refusal (n = 11), patient's refusal (n = 50), or other reasons (n = 14).

Trained, experienced medical interviewers obtained informed consent and administered a standardized questionnaire in the study participant's home shortly after diagnosis. (Questionnaire is available on request.)

Effects of ovarian cancer risk were measured by the

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Table I. Ovarian cancer cases according to histologic type

Histologic type	*Number*	*Percentage*
Serous	84	28
Serous, low malignant potential	35	12
Mucinous	17	6
Mucinous, low malignant potential	9	3
Endometrioid	76	26
Endometrioid, low malignant potential	8	3
Clear cell	12	4
Mixed epithelial	25	8
Undifferentiated	30	10
TOTAL	296	100

Table II. Discharge diagnoses among control group

Disease category	*Number*	*Percentage*
Infectious disease	6	2
Neoplasm	22	5
Endocrine-metabolic diseases	19	5
Disease of blood or blood-forming organs	4	1
Disease of nervous system	20	8
Disease of eye, ear, or mastoid	26	8
Varicose veins, hemorrhoids	5	1
Respiratory diseases	27	8
Digestive system diseases	55	16
Urinary diseases	18	5
Skin disorders	6	2
Musculoskeletal diseases	75	22
Congenital anomalies	4	1
Ill-defined conditions	18	5
Fractures and other injuries	38	11
TOTAL	343	100

estimated rate ratio—the ratio of ovarian cancer incidence in an exposed group to that in the corresponding unexposed group. A rate ratio of 2.0 for nulliparity, for example, indicates that the incidence rate is twice as great among the nulliparous women as among the parous women; conversely, a rate ratio of 0.5 indicates that the incidence is half as great. The rate ratio estimates were adjusted for the effects of confounding variables by stratified contingency table analysis (presented in the tables) and by logistic regression models, which gave similar results.[6] All trend tests used scored categorized data and were two-tailed.

For each estimate presented we adjusted for age and race. We assessed whether there were confounding effects of parity, difficulty conceiving, recent administration of oral contraceptives, surgical menopause, menopausal estrogen use, or family history of ovarian cancer, and we adjusted the estimates accordingly. If the number of confounders held constant exceeded three, we used a logistic regression model to produce smoothed estimates.

To derive unbiased estimates of the effects of tobacco, alcohol, and adult medical conditions, it was necessary to include in the control group only women who were admitted for conditions not caused by (or protected by) the exposure under assessment. Without such exclusions, a hospital-based control series would produce spurious results because the population of hospitalized women generally includes, for example, more smokers than the whole population of women at risk for ovarian cancer.

Results

A total of 12% of the patients with ovarian cancer and 14% of the controls were black, and the remainder were white. The mean age at diagnosis was 54.4 years among women with cancer and 54.7 years among controls. Because the control participants were chosen from the same hospitals as were the women with cancer, they were similar in social class and religion.

Greater parity was related to reduced risk in our study (Table III), and pregnancies that ended in spontaneous or induced abortion or stillbirth did not, as a group, confer any protection. When the effects of the different pregnancy outcomes were further separated, stillbirths appeared to increase risk, induced abortions appeared to slightly decrease risk, and spontaneous abortions appeared not to affect risk, but the estimates for the specific outcomes were rather unstable. There was also no clear pattern of risk when women were categorized according to the number of months pregnant with the different outcomes, adjusted for the effects of parity. It was necessary to adjust for the effects of parity in the examination of fetal loss because the two were correlated: about one fifth of the nulliparous women had some fetal loss, whereas about one half of the women with five or more live births had fetal loss. The strong protective effect of parity was seen in almost all subgroups and was strongest among women aged 20 to 39 years and weakest among those aged 60 to 79 years.

The protection afforded by greater parity was not explained by an effect of earlier first birth. On the other hand, as shown in Table IV, the apparent protection associated with earlier first birth, when this variable was considered alone, was eliminated by adjusting for parity. Also shown in Table IV is reduced risk among women who had breastfed their children, but an erratic relationship is shown between lifetime months of breastfeeding and risk.

The total group of women who had taken oral contraceptives showed no altered risk (Table V), but women who had taken them ≥3 years were at slightly reduced risk, as were women who had taken them recently. Women who took compounds with high levels of progestogen showed no excess ovarian cancer risk (data not shown). Those who quit after only 1 or 2 months, usually because of side effects, were not at

Table III. Estimated rate ratios according to pregnancies, births, and fetal losses

	Group with cancer	*Control group*	*Estimated rate ratio**	*95% Confidence interval*
Total pregnancies				
0	70	71	1.0	—
1	57	45	1.4	0.8-2.4
2	49	71	0.7	0.4-1.2
3	49	65	0.8	0.5-1.4
4	35	37	1.0	0.4-1.2
5+	35	54	0.7	0.4-1.2
Trend test		p (trend) = 0.10		
Live births				
0	89	84	1.0	—
1	54	53	1.0	0.6-1.7
2	71	85	0.8	0.5-1.3
3	43	60	0.7	0.4-1.2
4+	39	61	0.6	0.4-1.1
Trend test		p (trend) = 0.03		
Losses, adjusted for live births				
0	206	238	1.0	—
1	53	62	1.0	0.6-1.6
2	24	29	1.0	0.5-1.8
3+	13	14	1.2	0.5-2.7
Trend test		p (trend) = 0.70		

*Adjusted for age and race.

Table IV. Estimated rate ratios among parous women according to age at first birth and months of breastfeeding

	Group with cancer	*Control group*	*Estimated rate ratio**	*95% Confidence interval*
Age at first birth, adjusted for parity				
<20	42	52	1.0	—
20-24	72	108	0.7	0.4-1.2
25-29	58	62	1.0	0.5-1.7
≥30	34	33	1.0	0.5-2.0
Trend test		p (trend) = 0.22		
Months of breastfeeding, adjusted for parity				
0	112	121	1.0	—
1-9	62	84	0.8	0.5-1.2
10-18	16	37	0.5	0.2-0.9
19-110	13	15	1.1	0.5-2.6
Trend test		p (trend) = 0.14		

*Adjusted for age and race by logistic regression.

increased risk. The effect of oral contraceptives was similar for parous and nulliparous women, but it varied somewhat with age at diagnosis. Among women younger than 40 years old, oral contraceptives were weakly protective (rate ratio = 0.7), but among women aged 40 to 59 years, they were not (rate ratio = 1.1). Only one woman older than 59 years of age had taken oral contraceptives.

The effects of infertility were assessed in several ways. Married nulliparous women had a 70% higher risk than unmarried nulliparous women, an excess relative risk that was limited to those who reported difficulty conceiving (Table VI). Among the married nulliparous participants there was little difference in risk between those who had been pregnant and those who had not. In a separate confirmatory question, we asked married women who had never conceived why they had never been pregnant. Women who planned not to have children showed no increased risk compared with nonmarried nulliparous women (rate ratio = 1.0, 95% confidence interval = 0.4 to 2.4) but women who were unable to become pregnant had a corresponding rate ratio of 2.8 (95% confidence interval = 1.1 to 7.3). So few women reported each specific cause of infertility with confirmation by a physician that cause-specific estimates were quite unstable. Among parous women, a history of trouble conceiving was unrelated to risk (Table VI).

Participants were asked about a variety of medical factors found in previous studies to be related to risk of ovarian cancer. Our data on menopausal factors,

Table V. Estimated rate ratios according to oral contraceptive use for women younger than age 60 years

	Group with cancer	*Control group*	*Estimated rate ratio**	*95% Confidence interval*
Never took oral contraceptives	115	131	1.0	—
Ever took oral contraceptives	74	78	1.0	0.7-1.7
Duration (months)				
1-11	23	16	1.6	0.7-3.4
12-35	16	19	1.0	0.4-2.2
36-59	10	12	0.8	0.3-2.3
60+	25	31	0.8	0.4-1.5
Trend test		p (trend) = 0.76		
Latency (years since first taken)				
0-5	2	3	0.4	0.0-4.3
5-9	12	15	0.7	0.2-2.2
10-14	29	31	1.0	0.3-2.3
15+	30	29	1.1	0.6-2.1
Trend test		p (trend) = 0.72		
Recency (years since last taken)				
10+	28	24	1.4	0.7-2.6
1-9	38	41	0.9	0.5-1.6
<1	7	13	0.5	0.1-1.6
Trend test		p (trend) = 0.75		

*Adjusted for age and race; referent group for all comparisons is women who never took oral contraceptives.

Table VI. Estimated rate ratios according to reported difficulty conceiving*

	Group with cancer	*Control group*	*Estimated rate ratio†*	*95% Confidence interval*
Nulliparous women				
Never married	30	37	1.0	—
Ever married	59	47	1.7	0.9-3.4
No trouble conceiving or never tried	32	32	1.3	0.6-3.4
Had trouble conceiving	26	13	2.8	1.1-7.3
Parous women				
No trouble conceiving	164	209	1.0	—
Had trouble conceiving	42	50	1.0	0.6-1.7

*Women with incomplete responses excluded.
†Adjusted for age and race.

including protective effects of hysterectomy and menopausal estrogen, are detailed elsewhere. The results for selected childhood and adult diseases are given in Table VII. None of the childhood diseases influenced risk, regardless of whether it occurred before, after, or around the time of menarche. An extensive analysis of mumps revealed only that the protective effect of parity was absent among women who did not recall having had mumps.

Among the adult diseases, shingles was significantly protective but chickenpox was not. High blood pressure was weakly associated with increased risk. Thyroid disease was apparently protective, and hyperthyroidism was more protective than hypothyroidism (rate ratio = 0.5 and 0.9, respectively), but patients could not reliably make this distinction. Adrenal disease was reported by five women in the control group but no patients with cancer reported it. Diabetes was weakly protective. A history of asthma was also protective, but the effects of the illness and the asthma medication could not be distinguished because nearly all women with asthma had taken multiple medicines for their condition. Previous breast cancer was strongly related to risk but nulliparity, a strong risk factor for breast cancer and ovarian cancer, was present in only one of the 17 cases with previous breast cancer. There were only two histories of endometrial cancer among patients with cancer compared with four in the control group, a difference that was not statistically significant.

A family history of ovarian cancer in a sister, daughter or mother was reported by 13 patients with cancer and by only five women in the control group, which equals an elevated rate ratio of 3.3 (95% confidence interval = 1.1 to 9.4). No excess risks were seen for first-degree family histories of breast or endometrial cancer.

Obesity was not related to risk. We considered usual adult weight adjusted for height using Quetelet's index (weight ÷ height^2) divided into quartiles. The rate ra-

Table VII. Estimated rate ratios according to history of selected childhood and adult diseases

Disease	*Number of participants who recalled disease**			
	Group with cancer	*Control group*	*Estimated rate ratio†*	*95% Confidence interval*
Mumps				
No	87	92	1.0	—
Yes	192	220	0.9	0.6-1.4
German measles				
No	99	124	1.0	—
Yes	112	136	1.0	0.7-1.5
Measles				
No	46	47	1.0	—
Yes	181	222	0.8	0.5-1.3
Chickenpox				
No	49	59	1.0	—
Yes	228	257	1.0	0.7-1.6
Shingles				
No	273	284	1.0	—
Yes	18	38	0.5	0.3-0.9
High blood pressure				
No	189	213	1.0	—
Yes	96	97	1.2	0.8-1.8
Thyroid disease				
No	237	236	1.0	—
Yes	56	78	0.7	0.5-1.1
Diabetes				
No	271	274	1.0	—
Yes	21	27	0.8	0.4-1.5
Asthma				
No	279	260	1.0	—
Yes	13	26	0.4	0.2-0.9
Breast cancer				
No	278	337	1.0	—
Yes	17	5	4.2	1.4-13.2

*Participants with uncertain responses excluded.
†Adjusted for age and race.

tios in increasing quartiles were 1.0, 1.4, 1.0, and 1.1, respectively.

As shown in Table VIII, ovarian cancer risk was related to drinking but was not related to cigarette smoking. Alcohol use was measured as the typical weekly number of shot glasses of alcohol, bottles of beer, and glasses of wine consumed over the past 10 years, with total alcohol consumption computed as the sum of the three subtotals. The rate ratio rose slightly with increasing total alcohol consumption, and with each of the three kinds of alcohol considered separately. The rate ratios were highest for whiskey (rate ratio = 1.6, 95% confidence interval = 1.1 to 2.3), followed by wine (rate ratio = 1.3, 95% confidence interval = 0.9 to 1.9) and beer (rate ratio = 1.1, 95% confidence interval = 0.7 to 1.6).

Comment

The results of this investigation confirm the importance of parity, infertility, family history, and previous breast cancer in the cause of epithelial ovarian cancer. The results also suggest the relative unimportance of some other factors associated with risk in previous epidemiologic investigations.

Several explanations of the protective effect of childbearing have been proffered, among them that pregnancy prevents ovulation, that it inhibits pituitary secretion of gonadotropins, or that an underlying problem leads both to low parity and increased risk. Estimation of the effects of different pregnancy outcomes may help reveal how childbearing reduces risk of ovarian cancer. If parity protected against ovarian cancer simply by the inhibition of ovulation, then a pregnancy would reduce risk approximately in proportion to its length, regardless of outcome. Our data suggest that pregnancies that lead to live births offer protection but those that lead to losses may not. Inasmuch as women with more live births tend to have had more losses, adjustment for parity is critical. One previous estimate of the rate ratio adjusted for parity was 0.8 per miscarriage.[7] Other investigations of fetal loss are not directly comparable, either because they were not adjusted for the effect of parity or because they measured the fraction of pregnancies that ended in

Table VIII. Estimated rate ratios according to cigarette and alcohol use*

	Group with cancer	*Control group*	*Estimated rate ratio†*	*95% Confidence interval*
Cigarette smoking				
Never smoked	128	130	1.0	—
Quit	91	69	1.3	0.9-2.0
Current	70	83	0.8	0.6-1.3
Cigarette smoking (duration)				
Never smoked	128	130	1.0	—
10 years or less	28	23	1.1	0.6-2.2
11-30 years	65	66	0.9	0.6-1.5
31+ years	66	64	1.1	0.7-1.8
Trend test		p (trend) = 0.87		
Alcohol (average weekly consumption)				
0	109	122	1.0	—
Occasional drink	49	49	1.1	0.7-1.9
1-6 drinks	63	54	1.4	0.8-2.3
7-13 drinks	36	32	1.2	0.7-2.2
14+ drinks	34	26	1.5	0.8-2.8
Trend test		p (trend) = 0.14		

*Three participants without data on smoking duration or currency were deleted.
†Adjusted for age and race.

miscarriage rather than the number or months of various pregnancy outcomes.

Apart from the reduced risk associated with higher parity, there clearly seems to be a separate link between infertility and risk evident among the nulliparous women in our investigation. Previous studies have shown that married nulliparous women have a higher risk than single nulliparous women.[1,2] We clarified this observation by showing that married nulliparous women who chose not to become pregnant were not at increased risk, but women who tried and failed definitely were at increased risk. Case-control studies of ovarian cancer cannot easily assess infertility as a risk factor, because older women must recall often ill-defined diagnoses from decades earlier. One follow-up study of infertile women found increased ovarian cancer risk among subjects with nonhormonal infertility (rate ratio = 3.2, 95% confidence interval = 0.3 to 32.9),[8] but another did not.[9] Both studies observed very few cancers and both derived the expected rates of ovarian cancer from the general population of parous and nulliparous women, so the effects of parity and infertility could not be separated. A long-term follow-up study of a large cohort of infertile women could discriminate between the effects of different kinds of infertility and could provide useful etiologic clues. For example, anovulation that leads to infertility should protect against ovarian cancer if incessant ovulation is a key mechanism.

Several reproductive factors probably are not strongly related to risk. A majority of studies indicate that the number of live births and not their timing is the key factor. Our finding of reduced risk to women who breastfed their children confirms a previous observation[10] and supports the hypothesis that anovulation reduces risk. The absence of dose response may reflect the poor correlation between the number of months a woman breastfeeds and the months of ovulation suppression because of other factors such as body mass and variability in breastfeeding regimens. Menstrual factors such as age at menarche, menstrual symptoms, and age at menopause do not appear to be strongly related to risk of ovarian cancer in these or other data, although the plateau in age-specific incidence around menopause strongly suggests a change in risk broadly related to cessation of ovarian function. It is not clear whether menopausal estrogen use affects risk. Hysterectomy does appear to decrease risk, but the association may reflect increased clinical surveillance rather than decreased risk.[11]

An anomalous finding in this study was that women who take oral contraceptives had only a very slight reduction in ovarian cancer risk. The estimated rate ratios from many studies have been in the protective range of 0.5. to 0.7. We know of no biases in the current study that would distort our estimate of the effects of oral contraceptives. Other known risk factors showed the same patterns in this study as in other studies, and women with diagnoses potentially related to oral contraceptives were not selected as control participants. From all of the available data we infer that oral contraceptives protect some women from ovarian cancer.

A history of mumps infection has been found to be a weak protective factor in several previous investigations.[1,2] This effect, if real, is certainly not strong. The biologic meaning is in doubt because recall of mumps

history has been shown to be a poor indicator of antibody titer.[13] A careful examination of mumps exposure, assessed serologically, would be worthwhile. Most of the other childhood and adult diseases that we considered probably do not influence the development of ovarian cancer. The apparent protection conferred by a history of shingles, in the absence of an effect of chickenpox, has no ready explanation. Nor does the effect of asthma. The lack of effect of hypertension, obesity, or diabetes, accords with the inconsistent findings of previous studies. Two medical conditions that warrant further study are thyroid disease and adrenal disease. The examination of adult diseases as risk factors in a hospital-based case-control study is difficult because the control group should include only patients whose admission diagnosis is not related (positively or negatively) to the adult disease risk factor. Data from population-based studies with well-documented medical histories may clarify whether these two associations are real.

Women with a previous history of breast cancer were at substantially increased risk of ovarian cancer. This observation is not new[14] and appears to represent a true association. One goal of our painstaking pathologic and clinical review was to exclude metastatic breast and colon cancer; we believe misdiagnosis does not explain the finding. A family history of ovarian cancer seems to pose at least a three- to fourfold increased risk, as indicated by our results and the results of others.[2]

Smoking was not related to ovarian cancer in this investigation, as in most previous work, but the effects of alcohol remain unclear. Our study and others (e.g., Fasoli and Franceschi)[15] estimate slightly increased incidence of ovarian cancer among drinkers, but other studies of ovarian cancer found reduced incidence among drinkers (e.g., Gwinn et al. and Byers et al.).[16, 17] The available data suggest that if there is an association, it is weak.

During the past decade, case-control interview studies with 200 to 500 women with ovarian cancer have offered numerous leads. Comparisons among existing studies suggest that some of the leads warrant further pursuit. Despite their cost, larger studies are needed to give the statistical power to disentangle the effects of specific causes of infertility, varying paterns of oral contraceptives, and specific pregnancy outcomes.

REFERENCES

1. Weiss N. Ovary. In: Schottenfeld D, Fraumeni JF Jr, eds. Cancer epidemiology and prevention. Philadelphia: WB Saunders, 1982:871-80.
2. Greene MH, Clark JW, Blayney DW. The epidemiology of ovarian cancer. Seminars in oncology 1984:11:209-26.
3. Richardson GS, Scully RE, Nikrui N, Nelson JH Jr. Common epithelial cancer of the ovary. N Engl J Med 1983; 312:415-24.
4. Hartge P, Hoover R, McGowan L, Lesher L, Norris HJ. Menopause and ovarian cancer. Am J Epidemiol 1988; 127:990-8.
5. McGowan L, Norris HJ, Hartge P, Hoover R, Lesher L. Risk factors for ovarian cancer. Eur J Gynecol Oncol 1988;9:195-9.
6. Rothman K. Modern epidemiology. Boston: Little, Brown, and Co., 1986.
7. Risch HA, Weiss NS, Lyon JL, Daling JR, Liff JM. Events of reproductive life and the incidence of epithelial ovarian cancer. Am J Epidemiol 1983;117:128-39.
8. Ron E, Lunenfeld B, Menczer J, et al. Cancer incidence in a cohort of infertile women. Am J Epidemiol 1987; 125:780-90.
9. Brinton LA, Melton LJ, Malkasian GD, Bond A, Hoover R. Cancer risk following evaluation for infertility. Am J Epidemiol 1989;129:712-22.
10. Schneider AP. Risk factor for ovarian cancer. N Engl J Med 1987;317:508-9.
11. Weiss NS, Harlow BL. Why does hysterectomy without bilateral oophorectomy influence the subsequent incidence of ovarian cancer? Am J Epidemiol 1986;124: 856-8.
12. Cramer DW, Welch WR, Cassells S, Scully RE. Mumps, menarche, menopause, and ovarian cancer. AM J OBSTET GYNECOL 1983;147:1-6.
13. Menczer J, Modan M, Ranon L, Golan A. Possible role of mumps virus in the etiology of ovarian cancer. Cancer 1979;43:1375-9.
14. Multiple primary cancers in Connecticut and Denmark. Bethesda, Maryland: National Cancer Institute, 1985; DHHS publication no. 68.
15. Fasoli M, Franceschi S. Dietary factors and the risk of epithelial ovarian cancer. JNCI 1987;79:663-9.
16. Gwinn ML, Webster LA, Lee NC, Layde PM, Rubin GL. Alcohol consumption and ovarian cancer risk. Am J Epidemiol 1986;123:759-66.
17. Byers T, Marshall J, Graham S, Mettlin C, Swanson M. A case-control study of dietary and nondietary factors in ovarian cancer. JNCI 1983;71:681-6.